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(54) Night sight apparatus

(57) In night sight apparatus an image intensifier (10) suitable for general viewing forms an output image at an image surface (11) via optics (12) of an image at an intensifier screen (14). The image surface (11) is curved for viewing with eye piece optics (not shown) and is situated within the intensifier housing behind an access plane boundary (15). A second component (16), includes a sighting image at a superposition plane (17). A coherent fibre optic bundle (18) extends across the access plane boundary and serves to translate an image at an image surface (11) to the superposition plane (17), whereupon a sighting graticule is superimposed as in conventional night sights. The intensifier component (10) and second component (16) are separable at the access plane boundary, whereupon by removal of the fibre optic bundle (18), the intensifier tube (10) is suitable for general viewing.

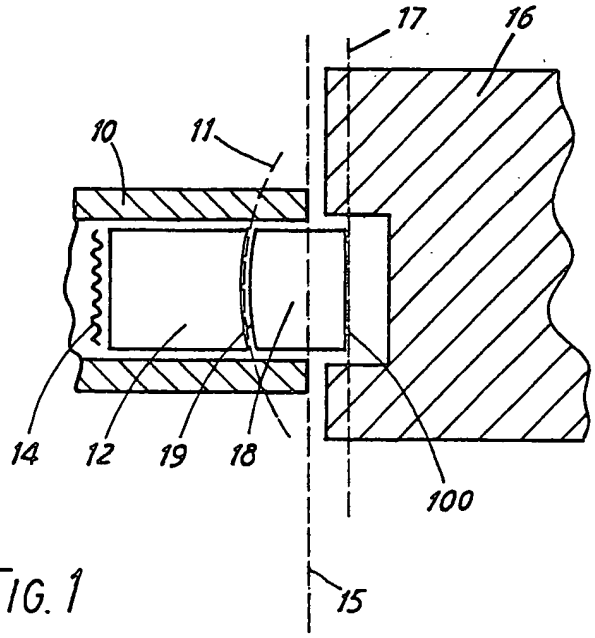

FIG. 1

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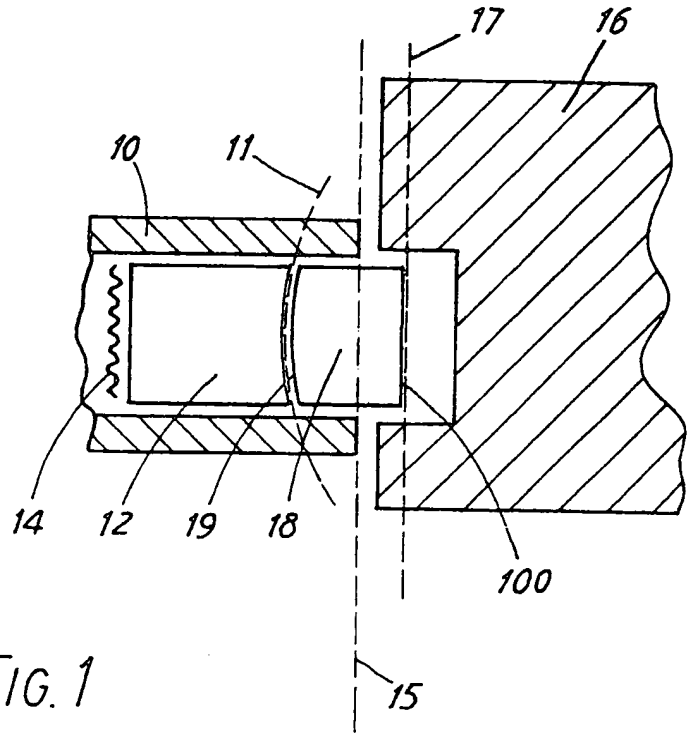

FIG. 1

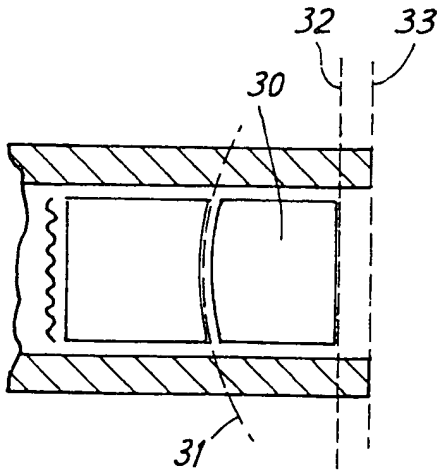

FIG. 3

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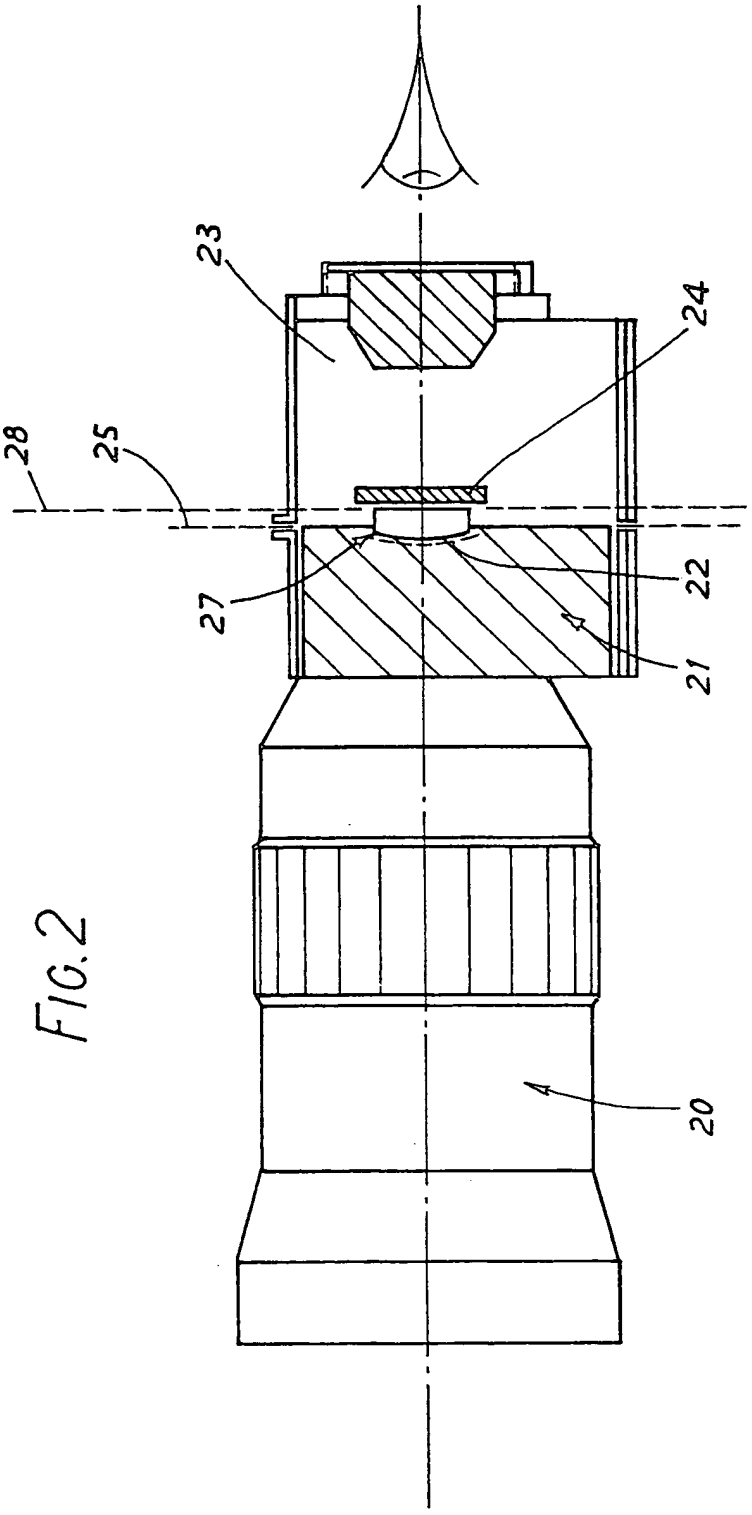

FIG.2

SPECIFICATION

Night sight apparatus

This invention relates to night sight apparatus, that is apparatus for enabling a firearm to be aimed in low light conditions.

A night sight comprises an image intensifier tube together with further optics for superimposing a sighting graticule on the intensified image. The sight is mounted on the firearm to be aimed, for example, a rifle, such that the sight axis aligns with the firearm bore sight. Clearly the sight must be optically accurate and the superposition optics and the intensifier are usually a matched pair, meaning that the subassemblies cannot be separated for, for example, replacement of a failed intensifier.

An image intensifier is useful in the battlefield not just for weapon aiming, but for surveillance, reconnaissance etc. Whilst some types of intensifier tube are dedicated to rifle sight applications, other types have been optimized for general viewing. Thus equipment has been procured with functionally different tubes, which are not interchangeable. It is clearly preferable to procure only a single type of tube so that supply and maintenance logistics are eased, and equipment interoperability permitted.

Unfortunately the tube characteristics required for the two applications envisaged above are not identical. In particular for direct viewing it is desirable that the image be formed on a concave spherical surface recessed within the intensifier housing. The housing prevents access to the image surface by external optical components, which can only be brought up to an acess plane boundary defined by the housing.

In optically accurate night sight tubes a planar image is formed to facilitate the superposition of a graticule which need only move along the axis of this plane when bore sighting. For these reasons the goal of a single tube type has not been realized.

In the case of the general viewing intensifier, for reasons of compactness, single eyepiece optics are generally used to view both the concave image of the surface of the intensifer tube and the graticule coaxially. In order to superimpose a graticule, it must be arranged that the graticule move a long a surface equivalent to the concave image surface if focus is to be maintained at all conjugate points between the extremes of boresighting positions.

According to the present invention night sight apparatus includes a first component having an image intensifier forming an image at a curved image surface and a second component having a sighting image generator and optics adapted to superimpose the sighting image on an incoming image at a superposition plane characterized in that the components are separable close to the superposition plane and a coherent fibre optic bundle extends between the image surface and the superposition plane to translate the intensified image from the image surface to the superposition plane.

Preferable the first and second components are separable at an access plane boundary, the fibre optic bundle extending across the access plane boundary from the image surface on one side of the boudary to a superposition plane on the other.

Advantageously the fibre optic bundle has a surface complementary to the image surface.

In order that features and advantages of the present invention may be further appreciated embodiments will now be described by way of example only and with reference to the accompanying diagramatic drawings, of which:—

Figure 1 represents a schematic view of a night sight in accordance with the present invention,

Figure 2 represents a practical arrangement, showing the sight optics in more detail, and

Figure 3 represents an alternative form of the invention.

In night sight apparatus (Fig. 1) an image intensifier 10 suitable for general viewing forms an output image at an image surface 11 via optics 12 of an image at an intensifier screen 14. The image surface 11 is curved for viewing with eye piece optics (not shown) and is situated within the intensifier housing behind an access plane boundary 15. A second component 16, which is described in more detail hereinafter, includes a sighting image at a superposition plane 17. A coherent fibre optic bundle 18 extends across the access plane boundary 15 and serves to translate an image at an image surface 11 to the superposition plane 17, whereupon a sighting graticule is superimposed as in conventional night sights.

The fibre optic bundle 18 is plano-convex, having a first face 19 complementary to the relay optics output surface, and a second plane face 100, a secondary image being formed at the plane face 100 when the fibre optic bundle 18 is mated to the image surface 11 by virture of the known property of image translation. The intensifier component 10 and second component 16 are separable at the access plane boundary 15, whereupon it will be realised that by removal of the fibre optic bundle 18, the intensifier tube 10 is suitable for general viewing.

In a practical embodiment of a night sight (Fig. 2) objective optics 20 relay an object to an intensifier 21 which produces an output image at an image surface 22. A sighting component 23 includes a graticule generator 24, an image of which may be superimposed on an incoming image, at a superposition plane 28, by virtue of placing the image generator 24 coincident with the superposition

plane 28. A coherent fibre optic bundle 27 extends from the image surface 22 accross the access plane boundary 28 and up to the superposition plane 25 as hereinbefore described, to translate the image to a secondary image plane. The superposition plane 28 is thus co-planar with both the secondary image and the graticule generator.

The components are separable at mating faces at the access plane boundary position 28, leaving the objective optics 20 and intensifier 21 usable without the sight. It will be appreciated that when used for general viewing other components, for example eye piece optics, may be attached to the intensifier mating face at or behind the access plane boundary 28. It will further be appreciated that in night sight apparatus a failed intensifier may be straightfowardly replaced by another genral viewing intensifier by virtue of a fibre optic bundle, which acts as an adaptor for this purpose. In this way the benefits of a single intensifier tube type may be realized.

In an alternative arrangement (Fig. 3) of the present invention, a fibre optic bundle 20 extends from an image surface 21 to a superposition plane 32, close to access plane boundary 33. Such an arrangmenet, in which the intensifier image is not translated across the acces plane boundary is useful with certain types of graticule generator which do not require image plane coincidence.

It will be appreciated the fibre optics bundles may be constructed which translate from the curved image surface to any desired output profile.

CLAIMS

The matter for which the applicant seeks protection is:—

1. Night sight apparatus including a first component having an image intensifier forming an image at a curved image surface and a second component having a sighting image generator and optics adapted to superimpose the sighting image on an incoming image at a superposition plane characterized in that the components are separable close to the superposition plane and coherent fibre optic bundle extends between the image surface and the superposition plane to translate the intensified image from the image surface to the superposition plane.

2. Night sight apparatus as claimed in claim 1 and wherein the first and second components are separable at an access plane boundary, the fibre optic bundle extending across the access plane boundary from the image surface on one side of the boudary to a superposition plane on the other.

3. Night sight apparatus as claimed in claim 1 or claim 2 and wherein the fibre optic bundle has a surface complementary to the image surface.

4. Night sight apparatus substantially as hereindescribed with reference to the drawings.

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